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ABSTRACT

The views of professionals concerning the future of the clinical laboratory sciences were assessed using a modification of the Delphi technique. The participating administrators, educators, and bench technologists were asked what they felt the clinical laboratory sciences would be like in 20 years, and their responses were used to develop statements regarding the future of the clinical laboratory. Additionally, statements related to articulation and a statewide articulation system in clinical laboratory education were included. Statements were grouped into four general categories: education/general; education/articulation, credentialling, and professional. Using the predictions of the panelists, it was possible to develop a scenario for the future of the field. It is predicted that in 1991, contrasted to 1981, fewer medical technologists will be entering the profession and more will be leaving than today. One reason for their leaving will be the increased utilization of advanced automated technology; the technology will produce a decreased need for technologists. Education of the clinical laboratorians is expected to change: the medical laboratory technician (MLT) education program will consist of a minimum of three academic years as compared to the current two-year minimum, and the hospital-based programs will increase from a minimum of 12 months to a minimum of 18 months. It is expected that all four-year institutions will provide competency-based exams to assess potential placement of the MLT in the curriculum. Questionnaires are appended. (SW)

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ED211000

CLINICAL LABORATORY SCIENCES: THE NEXT TWENTY YEARS

Presented

June 25, 1981
Miami, Florida
ASMT Annual Meeting

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By

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HE 014 618

INTRODUCTION

Many outside factors affect any educational program and the clinical laboratory sciences (CLS) is no exception. There is much concern over cost containment in the health care setting and one possible result of this concern that has often been mentioned is further reduction in the number of hospital based programs. Also within health care facilities there is a continuous growth in the numbers and types of technologically advanced procedures that are being developed and introduced to the market. These factors can have an effect on both educational programs and practitioners in the CLS area. Articles are appearing sporadically about the decreased numbers of applicants to CLS educational programs and increased numbers leaving the CLS field for employment in other sectors. Higher education is experiencing a period of retrenchment which also has an impact on CLS educational programs. At the Kentucky Council on Higher Education, we are concerned about the future of the clinical laboratory sciences and its impact on the education of professionals in this area. Because of this concern, a Delphi Probe was conducted, seeking expert opinions from CLS educators, laboratory administrators, supervisory technologists and bench technologists in the Commonwealth.

The Delphi Probe

The Delphi Probe is a process developed by Olaf Helmer in 1963 for technological forecasting by the Rand Corporation. Since then, several modifications/improvements have been added, including computer-

ization of the process. The process seeks to obtain consensus on future events and conditions from a panel of experts. Computer terminals or mail responses eliminate inter-personal dynamics that exist in face-to-face group meetings. The panelists are not aware of who the other panelists are and thus are less apt to be influenced by people they perceive as having greater status. Panelists compare and contrast descriptions and predictions of the future with their colleagues after thoughtful weighing of alternatives and counter views.

Generally, Round I of the probe consists of open ended questions designed to identify the scope of forecasting. From these questions, panelists generate a list of predictions. Round I responses/predictions are abstracted and distributed to all panelists as Round II. Often questions such as how desirable the statements are or when they are most apt to occur are asked.

Round III consists of the statements on which consensus was not reached. Panelists are told the Round II median and first and third quartile responses for each statement. They may, after comparing their response to other responses, choose to change, moving toward the median. If they are outside the first and third quartiles and choose to remain there, they are asked to justify their reason for doing so in writing. This justification is shared with other panelists in the next Round.

For Round IV, all Round III statements on which consensus was reached are removed. Panelists repeat the response procedure, as in Round III, after reading written justifications for responses outside the first and third quartiles.

METHODOLOGY

Round I

Forty-two clinical laboratory practitioners, supervisors, administrators and educators were invited to participate. A letter (Appendix A) was sent to them explaining the process, a time schedule for the entire process, the approximate amount of time that would be required of each panelist to respond to each Round, the Round I Questionnaire, and a participant-non-participant post card.

A modification of the Delphi technique was utilized. Twenty practitioners and educators were contacted by telephone and asked what they felt the clinical laboratory sciences would be like in twenty years. Their responses were used to develop statements regarding the future of the clinical laboratory. Additionally, in order to ascertain feelings regarding a project currently under way at the Council, statements were added to this list related to articulation and a statewide articulation system in clinical laboratory education.

Statements were grouped into four general categories: Education/General; Education/Articulation, Credentialing and Professional. A total of fifty-six statements were generated (Appendix A). Three questions were asked regarding each of these fifty-six statements:

1. What effect would this event have on course content in Clinical Laboratory Sciences Programs?

   1 = No Effect

   5 = Great Effect

2. In your opinion, by what year (1981-2001) does the probability of occurence reach 90%? (N = Never)

3. How desirable is this event?

   1 = Very Undesirable

   5 = Very Desirable

Rounds II and III

Round I results were received and analyzed by computer. Statements on which consensus was reached were removed from the Round I instrument. In this study consensus was defined as 75% or more of the panelists' responses falling between the first and third quartiles.

The Round II questionnaire consisted of those statements in Round I for which consensus had not been reached. A similar process was followed for developing the Round III instrument. For each respondent, the median and first and third quartile responses were indicated plus the panelist's response on the previous Round. Thus, each participant had the opportunity to compare each response to those of other participants.

After the completion of Round III, additional final response statistics were calculated on the final responses of the panelists. The participants were divided into members and non-members of the medical technology

professional organization, American Society for Medical Technology (ASMT) in order to determine if a statistically significant difference in responses to the questionnaire existed between the "member" and "non-member" categories. The statistics were computed on the overall responses of these two groups to the four categories, Education/General, Education/ Articulation, Credentialing, and Professional.

Also of interest was whether employment status of the respondent had any influence on their response. Thus the list of panelists was broken down into three employment status groups: educators, laboratory administrators and bench technologists. Using these three employment groupings, an ANOVA was run on the overall responses of these three groups to the four categories of questions and a Scheffe multiple range test performed on significant results.

Results

Of the forty-two persons invited to participate, 31 or 74% responded. In Round II, five persons dropped out. (Two of these were categorized as drop-outs because their responses were received after data had been submitted to the computer.) Round III yielded four drop-outs, again with two of these responding after information had been submitted to the computer. Thus, for Round I there were 31 respondents, Round II, 26 respondents and for Round III, 22 respondents.

Education/General

Consensus was reached on 56% of the statements' predicted time of occurence in the area of Education/General. Arranging the statements in chronological order based on the median year predicted by the panelists, we find:

	Q_1	Med	Q_3	Effect on Education*	Desirability**
3. Hospital based portion of educational process will have increased from a minimum of twelve months to a minimum of eighteen months.	1990	1990	1995	4	3
1. The MLT Educational Program will consist of a minimum of three academic years.	1990	1991	N	4	3
9. The amount of theoretical knowledge needed will decrease as the emphasis shifts more to a need for "Button Pushing" Technicians.	1990	2000	N	4	1
2. Entry level to the field of medical technology will be at the masters level.	1995	2001	N	5	2

*1 = No Effect; 5 = Great Effect
**1 = Very Undesirable; 5 = Very Desirable

Education/Articulation

Of the statements related to educational articulation, consensus was reached on 85%.

		Q_1	Med	Q_3	Effect on Education*	Desirability**
12.	Hospital based programs will grant the MLT(AD) advanced placement in the program based on certification.	1983	1985	1990	3	4
19.	Competency based exams will be utilized by all four-year institutions in order to assess potential placement of the MLT(AD) in the MT Curriculum.	1986	1987	1990	3	4
10.	Hospital based CLS programs will recognize professional course work completed by MLTs who have graduated from NAACLS Approved programs and provide a shorter course of study.	1985	1988	1990	4	4
13.	Hospital based programs will grant the MLT(C) advanced placement in the program on the basis of certification.	1985	1988	1990	3	3
21.	Competency based exams will be utilized by all hospital based programs in order to asses placement of the MLT(AD) in the MT curriculum.	1986	1989	1990	3	4
15.	All state institutions will be able to provide a totally articulated curriculum allowing the MLT(AD) to complete the BS degree in two additional years.	1990	1990	1995	4	4
16.	All state institutions will be able to provide a totally articulated curriculum allowing the MLT(C) to complete the BS degree in three additional years.	1987	1990	N	4	3
18.	All students in Clinical Laboratory Sciences Education programs will first become MLT(AD)s with the option of continuing their education 2 additional years to become medical technologists.	1990	2001	N	5	2

*1 = No Effect; 5 = Great Effect
**1 = Very Undesirable; 5 = Very Desirable

	Q_1	Med	Q_3	Effect on Education*	Desirability**
Education/Articulation - Continued					
42. Increased utilization of automation will result in a need for decreased numbers of technologists.	1985	1990	N	3	2
33. Medical Technologists will become unionized as part of an existing union.	1991	1995	N	3	2
29. Medical Technologists will be only supervisors and educators.	1995	1999	N	4	2
30. MLTs will provide all bench performance.	1990	2000	N	4	2
34. The Medical Technology Professional Organization will become a bargaining agent.	1990	2000	N	2	3
40. Analysts will learn that automated procedures are not measuring the analytes they are purported to measure.	1985	1999	N	4	2
43. Medical Technologists will interpret all test results.	1987	2001	N	5	4
46. There will be an increase in the number of on-the-job trained persons utilized in clinical laboratories.	1987	2001	N	4	1
31. MLTs will no longer be in existence	2001+	N	N	4	1
38. Medical Technologists will have employment contracts with their employer, renewable annually.	1991	N	N	3	3
48. Physicians Assistants will perform all lab tests.	N	N	N	3	1

*1 = No Effect; 5 = Great Effect
**1 = Very Undesirable; 5 = Very Desirable

Credentialling

Consensus was reached on 67% of the Credentialling statements' predicted time of occurence.

	Q_1	Med	Q_3	Effect on Education*	Desirability**
24. Recertification will be by paper and pencil tests only.	1986	1990	N	3	2
or					
27. Recertification will be based totally on documented attendance at continuing education programs.	1986	1990	N	3	3
25. Recertification will be by performance exams only	1990	N	N	3	2
28. National certification will give way to state licensure in all states with reciprocity.	1993	N	N	3	2

The Profession

Of the statements related to the practice of the profession, consensus was reached on 64% .

	Q_1	Med	Q_3	Effect on Education*	Desirability**
41. Automated procedure utilization will increase.	1982	1984	1985	4	4
32. The number of MTs entering the profession will continue to decline.	1982	1985	1986	4	1
39. Increasing numbers of MTs will leave the field of medical technology to specialize in other related fields such as education.	1981	1985	1990	4	2
55. There will be increased sharing of exotic equipment as cost containment becomes of increasing concern.	1985	1987	1990	3	4
49. Nurses will perform all basic lab tests at all physician and clinic labs.	N	N	N	3	1
51. Pathologists will no longer be laboratory directors.	1995	N	N	4	3
52. Blood collecting and processing will be totally automated.	2000	N	N	3	2

*1 = No Effect; 5 = Great Effect

**1 = Very Undesirable; 5 = Very Desirable

Statements on which consensus was reached may be found in Appendix C. The range of responses is represented by a triangle. The apex of the triangle represents the median, the left side represents the first quartile, the right side represents the third quartile. In some instances there is only half of a triangle which indicates that the median and either the first or third quartile were identical. The width of the triangle is a measure of the range of the responses; triangles with points for the right and left sides illustrate that one hundred percent of the participants reached consensus.

Of the responses to question one, "To what degree would this event affect the course content of educational programs in CLS?", 59% of the median responses were "moderate effect (3)." No median response was "no effect (1)," or a "great effect (5)." (Appendix C)

Question two (for each statement) "In your opinion, by what year (1981-2001) does the probability of occurance reach 90%?," resulted in 31% of the median responses being between 1986-1990 and 28% between 1996 and 2001 (Appendix C).

"How desirable is this event?" was question number three. One third of the median responses were "slightly undesirable (2)," 30% were "undecided (3)" and there were no "very desirable" or "5" responses.

Comparison of responses from ASMT members and non members in the four general categories utilizing T-tests resulted in a significant difference at an alpha of .01 (Table 1). This was for only the cre-

dentialing category statements for the question "To what degree would this event affect the course content of CLS educational programs?" Those respondents who are members of ASMT tended toward a "small effect" while non-member responses tended toward large effect.

TABLE 1 Statistics for ASMT membership vs non-membership in four statement categories

Area	Question 1	Question 2	Question 3
Education/General	-0.93	0.77	-0.83
Education/Articulation	0.11	0.57	1.39
Credentialling	-3.32*	0.56	-0.65
Professional	-1.22	0.40	-0.21

* $P \leq .05$

When respondents were divided into the three groups of administrators, educators and bench technologists and their responses were compared by Analysis of Variance, it was found that a significant difference at an alpha of .01 existed for the Education/General category for question 3, "How desirable is this event?" A Sheffé Multiple Range Test showed that a significant difference in responses existed between educators and bench technologists, educators tending toward "slightly undesirable" and bench technologists toward "slightly desirable."

Summary and Conclusions

Using the predictions of the panelists, it was possible to develop the following scenario:

In 1991, contrasted to 1981, fewer medical technologists will be entering the profession and more medical technologists will be leaving the profession than today. Those leaving will be specializing in other related fields. One reason for their leaving will be the increased utilization of advanced automated technology; the technology will produce a decreased need for technologists. Increased concern for cost containment will lead to increased sharing of exotic equipment among laboratories; the decreased amount of equipment in individual laboratories will contribute to the decreased need for technologists.

Education of the clinical laboratorians will change; the MLT education program will consist of a minimum of three academic years as compared to the current two year minimum. The hospital based programs will increase the length of a program from a minimum of twelve months to a minimum of 18 months.

Hospital-based programs will grant advanced placement in the program to MLTs on the basis of certification. They will also utilize competency based exams and will recognize professional course work completed by MLTs who graduate from NAACLS approved programs; the time for the course of study will be reduced.

All four year institutions, public and private, will provide competency based exams to assess potential placement of the MLT in the curriculum. All state institutions will provide a totally articulated curriculum.

Professional recertification will be by paper and pencil tests only or, more preferrably, based totally on documented attendance at continuing education programs.

In twenty years, by the year 2001, ASMT will have become a bargaining agent. Medical technologists will be only supervisors and educators; as supervisors, they will interpret all test results. MLTs and an increased number of on-the-job trained persons will be performing all bench work. Concurrently, it will be discovered that some of the highly automated equipment does not measure the analytes they have been purported to measure.

A possible reason for the MLTs' performing all bench work and MTs' becoming supervisors is that the amount of theoretical knowledge needed will decrease as the emphasis has shifted to a more "button pushing" technology. All students in the clinical laboratory sciences education programs will first become MLTs with the option of continuing their education the additional years needed to become medical technologists; entry into the profession will be at the masters level.

The events for which consensus was reached and the median was predicted as "Never" are also of interest. Those events seen as undesirable and predicted to never occur were:

> Professional recertification will be by performance examination only.
>
> National certification will cease, being replaced by state licensure in all states, with reciprocity.

MLTs will no longer be in existence.

Physicians assistants and nurses will perform all basic laboratory tests at physician and clinic labs.

Blood collection and processing will be totally automated.

Two events seen as desirable but still predicted to never occur were:

Medical technologists will have employment contracts with employers, renewable annually.

Pathologists will no longer be laboratory directors.

A significant number of the NEVER statements related to events that would directly impinge on the medical technologist and thus the question may be raised as to the objectivity of the panelists. These statements related to: MLTs ceasing to exist; PAs and nurses performing a significant number of lab tests; blood collection and processing becoming totally automated.

Ninety-seven percent of the statements on which consensus was reached were seen as having an effect on the course content in CLS programs. Most of the events (66%) were predicted to occur between 1986 and 2001. Even though the events have been (1) predicted to occur in the next twenty years and, (2) to have a significant effect on the course content and thus the educational process utilized to produce future Clinical Laboratory Scientists, only 44% of the events were found to be desirable - leaving 56% as undesirable!

ASMT member and non-member panelists differed in their responses to more of the credentialing statements than to any of the other statements and the number of respondents in each category was equal. One reason for this difference might be due to the amount of emphasis placed on re-certification by the professional organization.

On the basis of these panelists' predictions, in order to prepare for the future, the following recommendations are made:

(1) educational program directors need to prepare for even fewer applicants to their programs;

(2) laboratory administrators need to prepare for fewer technologists entering the field;

(3) more instrumentation, automation and computerization need to be included in curricula;

(4) laboratory administrators should begin looking at how sharing resources will affect the laboratory;

(5) a thorough study of new procedures should be undertaken, comparing them with reference procedures prior to utilization for routine purposes (ex: careful checking of RIA for cross reactivity) in order to assure that correct analytes are being measured;

(6) a means to permit the MLT to articulate with the greatest ease while boosting FTE needs to be developed by both university and hospital based programs;

(7) expansion of programs to prepare masters level supervisors and educators and three year technicians needs to be considered.

(8) educational institutions should look closely at their continuing education program projections in terms of properly meeting the challenge of recertification requirements.

(9) ASMT should continually evaluate its purpose, mission statements and position in light of unionization of medical technologists.

In order to meet the challenge of tomorrow, preparations must begin today.

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APPENDIX A

Ms. Frances J. Morris
Higher Education Specialist
Council on Higher Education
West Frankfort Office Complex
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Frankfort, Kentucky 40601

Kentucky Council on Higher Education Delphi
Probe: "Clinical Laboratory Sciences - -
The Next Twenty Years"

_____ I will return the Round I Questionnaire by January 30 and participate in the Probe.

_____ Thank you for the invitation to participate; however, I must decline.

Number _____

COMMONWEALTH OF KENTUCKY

COUNCIL ON HIGHER EDUCATION

FRANKFORT, KENTUCKY 40601

November , 1980

Dear :

The Council on Higher Education is the agency charged with the responsibility to coordinate public higher education and to develop comprehensive plans for higher education in the Commonwealth of Kentucky. The education of persons in the clinical laboratory sciences is within the missions of Kentucky's institutions. It is our goal to support the development and conduct of clinical laboratory science educational programs designed to educate practitioners for the current and future health care delivery system. You can assist us in the successful attainment of that goal.

I would like you to share your professional knowledge and expertise with a panel of experts from Commonwealth of Kentucky educational institutions, affiliates, and health care facilities. The panel will be made up of clinical laboratory administrators, clinical laboratory sciences practitioners, and clinical laboratory sciences educators. As an expert in your area, I would like for you to predict the nature of clinical laboratory sciences education, credentialing, and professional changes over the next 20 years. Mathematical formulae cannot address this issue. Your collective thinking, a carefully formed time-based opinion, will be invaluable to health care planning. The Delphi forecasting technique will be used to quantify your opinions. I have enclosed a brief description of the Delphi process. You will be asked to respond to three rounds of questions:

Round	Approximate Time To Complete	Date Received	Date Returned
I	30 minutes	January 16	January 30
II	20 minutes	February 20	March 6
III	10 minutes	March 27	April 10

Panel participants will not be identified to one another and all responses will be summarized to guarantee confidentiality. A copy of the results will be provided to each participant.

Enclosed please find a stamped self-addressed postcard on which you can reply initially and an envelope in which to return Round I. I invite you to complete the enclosed Round I questionnaire and mail it by January 30.

If you have any questions and/or comments regarding participation or the procedure, please contact this office. I have assigned principal staff responsibility for this project to Frances J. Morris, (502) 564-3745. Your kind consideration of this request is appreciated. Your willingness to share your opinions will substantially contribute to the education of future clinical laboratory science practitioners. Thank you.

Sincerely,

Harry M. Snyder
Executive Director

HMS/FJM/skt

Enclosures

Briefly, the Delphi will consist of the following activities:

Round I Questionnaire

1. Several clinical laboratory sciences educators and practitioners were asked an open-ended question about future trends, events and activities in the clinical laboratory.
2. Their responses to the open-ended question were collapsed into change statements which include all their statements or opinions and are on the attached questionnaire.
3. You as a panel member will be asked to respond to three questions about each change statement.
4. The median responses and response quartiles for each change statement will be calculated.
5. A second questionnaire showing the above statistics and your response to each change statement question will be prepared.

Round II Questionnaire

1. You will be asked if you wish to change your position on any question (you can compare your response with the median etc.).
2. If you are not in the quartile on either side of the median, you must justify your position, or if you move beyond the 1st or 3rd quartile you must justify your move.
3. Results will be tested for consensus and again prepared for presentation to the participants.

Round III Questionnaire

Steps for Round II will be repeated and results will be tested for consensus. The results will be summarized and a scenario describing the future will be written. The results will then be shared with you and the other participants.

Directions for Completion of the Attached Round I Questionnaire:

Please plan on setting aside 20-30 minutes for its completion. At the top of the questionnaire is your identification number. The statements to which you are to respond are listed on the left. Across the top of the page are three questions regarding each of these statements. To the right of each statement is a space for answering each question. Please answer all three questions for each of the change statements. Remember that Question 2 asks for a range of from 1981-2001 only, not beyond 2001.

Number _____

ROUND I DELPHI QUESTIONNAIRE

KENTUCKY COUNCIL ON HIGHER EDUCATION

"Clinical Laboratory Sciences -- The Next Twenty Years"

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
I. EDUCATION/GENERAL			
1. The MLT educational program will consist of a minimum of three academic years.	1 2 3 4 5	_____	1 2 3 4 5
2. Entry level to the field of medical technology will be at the Masters level.	1 2 3 4 5	_____	1 2 3 4 5
3. Hospital based portion of the educational process will increase in length from a minimum of twelve months to a minimum of eighteen months.	1 2 3 4 5	_____	1 2 3 4 5
4. Due to cost containment there will no longer be hospital based programs.	1 2 3 4 5	_____	1 2 3 4 5
5. There will be increased volunatary participation in continuing education.	1 2 3 4 5	_____	1 2 3 4 5

Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
6. Doctoral programs in medical technology will be developed in response to the knowledge explosion in the field of clinical laboratory sciences.	1 2 3 4 5	_____	1 2 3 4 5
7. Educational programs in the clinical laboratory sciences will be restructured to produce only specialists in the areas of hematology, clinical chemistry, microbiology, immunology, and immunohematology.	1 2 3 4 5	_____	1 2 3 4 5
8. The generalist medical technologist will be at the higher educational level than specialists, pulling together information from each of the specialties for reporting and integration.	1 2 3 4 5	_____ _____	1 2 3 4 5
9. The amount of theoretical knowledge needed will decrease as the emphasis shifts more to a need for "button pushing" technicians.	1 2 3 4 5	_____	1 2 3 4 5

Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
II. EDUCATION/ARTICULATION			
10. Hospital based clinical laboratory sciences programs will recognize professional course-work completed by MLTs who have graduated from NAACLS approved schools and provide a shortened course of study for the student.	1 2 3 4 5	_____	1 2 3 4 5
11. Four year institutions will accept the MLT(AD) into the third year of their program on the basis of certification.	1 2 3 4 5	_____	1 2 3 4 5
12. Hospital based programs will grant the MLT(AD) advanced placement in the program on the basis of certification.	1 2 3 4 5	_____	1 2 3 4 5
13. Hospital based programs will grant the MLT(C)* advanced placement in the program on the basis of certification.	1 2 3 4 5	_____	1 2 3 4 5
14. A minimum of one institution will be designated in the eastern and western regions of the state to provide total articulation for MLTs (AD & C).	1 2 3 4 5	_____	1 2 3 4 5

*MLT(C) was formally referred to as CLA.

Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
15. All state institutions will be able to provide a totally articulated curriculum allowing the MLT(AD) to complete the BS in two additional years.	1 2 3 4 5	_____	1 2 3 4 5
16. All state institutions will be able to provide a totally articulated curriculum allowing the MLT(C) to complete the BS in three additional years.	1 2 3 4 5	_____	1 2 3 4 5
17. Curricular content will be broken down into small components or modules, allowing the MLT(AD) or (C) to enter medical technology programs at the specific level of their educational ability.	1 2 3 4 5	_____	1 2 3 4 5
18. All students in clinical laboratory sciences education programs will first become MLT(AD)s with the option of continuing their education 2 additional years to become medical technologists.	1 2 3 4 5	_____	1 2 3 4 5

Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
19. Competency based examinations will be utilized by all four year institutions in order to assess potential placement of the MLT(AD) in the MT curriculum.	1 2 3 4 5	_____	1 2 3 4 5
20. Competency based examinations will be utilized by all four year institutions in order to assess potential placement of the MLT(C) in the MT curriculum.	1 2 3 4 5	_____	1 2 3 4 5
21. Competency based exams will be utilized by all hospital based programs in order to assess placement of the MLT(AD) in the MT curriculum.	1 2 3 4 5	_____	1 2 3 4 5
22. Competency based exams will be utilized by all hospital based programs in order to assess placement of the MLT(C) in the MT curriculum.	1 2 3 4 5	_____	1 2 3 4 5

Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
III. CREDENTIALING			
23. Re-certification will be legally mandated.	1 2 3 4 5	_____	1 2 3 4 5
24. Re-certification will be by pencil and paper tests only.	1 2 3 4 5	_____	1 2 3 4 5
25. Re-certification will be by performance examinations only.	1 2 3 4 5	_____	1 2 3 4 5
26. Re-certification will be a combination of paper & pencil examinations & performance examinations.	1 2 3 4 5	_____	1 2 3 4 5
27. Re-certification will be based totally on documented attendance at continuing education programs.	1 2 3 4 5	_____	1 2 3 4 5
28. National certification will give way to state licensure in all states with reciprocity.	1 2 3 4 5	_____	1 2 3 4 5

Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
IV. PROFESSIONAL			
29. Medical technologists will be only supervisors & educators.	1 2 3 4 5	_____	1 2 3 4 5
30. MLTs will provide all bench test performance.	1 2 3 4 5	_____	1 2 3 4 5
31. MLTs will no longer be in existence.	1 2 3 4 5	_____	1 2 3 4 5
32. The number of MTs entering the field will continue to decline.	1 2 3 4 5	_____	1 2 3 4 5
33. Medical Technologists will become unionized as part of an existing union.	1 2 3 4 5	_____	1 2 3 4 5
34. The medical technology professional organization will become a bargaining agent.	1 2 3 4 5	_____	1 2 3 4 5
35. Salaries of medical technologists will increase.	1 2 3 4 5	_____	1 2 3 4 5
36. Medical technologists will be given increased authority.	1 2 3 4 5	_____	1 2 3 4 5

Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
37. The public image of the medical technologist will improve.	1 2 3 4 5	_____	1 2 3 4 5
38. Medical technologists will have annual employment contracts with their employer, renewable each year.	1 2 3 4 5	_____	1 2 3 4 5
39. Increasing numbers of MTs will leave the field of medical technology to specialize in other related fields such as education.	1 2 3 4 5	_____	1 2 3 4 5
40. Analysts will learn that automated procedures are not measuring the analytes they are purported to measure.	1 2 3 4 5	_____	1 2 3 4 5
41. Automated procedure utilization will increase.	1 2 3 4 5	_____	1 2 3 4 5
42. Increased utilization of automation will result in a need for decreased numbers of technologists.	1 2 3 4 5	_____	1 2 3 4 5
43. Medical technologists will interpret all test results.	1 2 3 4 5	_____	1 2 3 4 5

Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
44. The government will gain increased control over all laboratory functions.	1 2 3 4 5	_____	1 2 3 4 5
45. Medical technologists will become integral members of a team approach to health care, working on teams with other health care professionals such as pharmacists and respiratory therapists.	1 2 3 4 5	_____	1 2 3 4 5
46. There will be an increase in the number of on-the-job trained persons utilized in clinical laboratories.	1 2 3 4 5	_____	1 2 3 4 5
47. Tighter constraints by third party payers will lead to limits on the number of laboratory tests performed per patient per type of disorder.	1 2 3 4 5	_____	1 2 3 4 5
48. Physicians assistants will perform all basic (CBC, urines, blood sugars) laboratory tests in clinical facilities as well as physicians offices.	1 2 3 4 5	_____	1 2 3 4 5
49. Nurses will perform all basic laboratory tests at all laboratories located in physicians offices & clinics.	1 2 3 4 5	_____	1 2 3 4 5

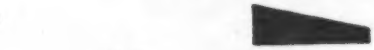
Number _____

STATEMENT	Question 1 To what degree would this event affect the course content of educational programs in the Clinical Laboratory Sciences? 1= No Effect 5= Great Effect	Question 2 In your opinion, by what year (1981 - 2001) does the probability of occurrence reach 90% (N=Never)	Question 3 How desirable is this event? 1= Very Undesirable 5= Very Desirable (Circle Answer)
50. Medical technologists will perform an increasing amount of research activities in clinical facilities.	1 2 3 4 5	_____	1 2 3 4 5
51. Pathologists will no longer be laboratory directors.	1 2 3 4 5	_____	1 2 3 4 5
52. Blood collection and processing will be totally automated.	1 2 3 4 5	_____	1 2 3 4 5
53. The medical technologist will make decisions relative to the need for further testing, based on test results already derived.	1 2 3 4 5	_____	1 2 3 4 5
54. There will be fewer, larger & more centralized laboratories with a decreased number of labs in physicians offices and clinics.	1 2 3 4 5	_____	1 2 3 4 5
55. There will be increased sharing of exotic equipment as cost containment becomes of increasing concern.	1 2 3 4 5	_____	1 2 3 4 5
56. Laboratory administrators will be non-medical technologists.	1 2 3 4 5	_____	1 2 3 4 5

APPENDIX B

Statement	No Effect 1	2	Effect 3	4	Great Effect 5
10. THE MEDICAL TECHNOLOGY PROFESSIONAL ORGANIZATION WILL BECOME A [illegible] AGENT.					
9. THERE WILL BE INCREASED VOLUNTARY PARTICIPATION IN CONTINU- [illegible] EDUCATION.					
11. THERE ARE [illegible] SITUATIONS WITH A SHORT TIME INTERVAL INTO THE FUTURE [illegible] CERTIFICATION.					
12. [illegible] BASED PROGRAMS WILL START THE INITIAL ADVANCED PLACE- [illegible] IN THE PROGRAM ON THE BASIS OF CERTIFICATION.					
13. [illegible] BASED PROGRAMS WILL START THE INITIAL ADVANCED PLACE- [illegible] IN THE PROGRAM ON THE BASIS OF CERTIFICATION.					
15. [illegible] BASED EXAMINATIONS WILL BE ATTENDED BY ALL THOSE [illegible] IN THE BY CORRESPON.					
20. [illegible] BASED EXAMINATIONS WILL BE ATTENDED BY ALL THOSE [illegible] IN THE BY CORRESPON.					
21. [illegible] BASED EXAMS WILL BE ATTENDED BY ALL DOCTORS BASED [illegible] IN THE BY CORRESPON.					
24. RE-CERTIFICATION WILL BE BY PENCIL AND PAPER TESTS ONLY.					
25. RE-CERTIFICATION WILL BE BY PERFORMANCE EXAMINATIONS ONLY.					
27. RE-CERTIFICATION WILL BE BASED TOTALLY ON DOCUMENTED [illegible] IN CONTINUING EDUCATION PROGRAMS.					
28. [illegible] CERTIFICATION WILL GIVE WAY TO STATE LICENSURE IN [illegible] WITH [illegible].					
33. [illegible] TECHNOLOGISTS WILL BECOME UNIONIZED AS PART OF AN [illegible] UNION.					
35. SALARIES OF MEDICAL TECHNOLOGISTS WILL INCREASE.					
37. THE PUBLIC IMAGE OF THE MEDICAL TECHNOLOGIST WILL IMPROVE.					
38. [illegible] EMPLOYERS WILL SET ANNUAL EMPLOYMENT CONTRACTS [illegible] EMPLOYEES. [illegible] [illegible].					
43. [illegible] SIMPLIFICATION OF AUTOMATION WILL RESULT IN A NEED FOR [illegible]					
47. IN THE [illegible] OF [illegible], THE [illegible] [illegible] THE [illegible], WILL [illegible] THE [illegible].					
48. PHYSICIANS ASSISTANTS WILL PERFORM ALL BASIC LAB TESTS.					
49. [illegible] WILL PERFORM ALL BASIC LAB TESTS AT ALL PHYSICIAN & [illegible] CLINICS.					
53. BLOOD COLLECTIONS & PROCESSING WILL BE TOTALLY AUTOMATED.					
54. [illegible] [illegible] IN [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].					
56. [illegible] WILL [illegible] [illegible] OF [illegible] EQUIPMENT AS COST [illegible].					
58. LABORATORY ADMINISTRATORS WILL BE NON-MED TECHS.					
1. THE MLT [illegible] PROGRAM WILL CONSIST OF A MINIMUM OF THREE [illegible] YEARS.					
3. [illegible] BASED [illegible] OF [illegible] [illegible] [illegible] [illegible] [illegible]

Statement	No Effect 1	2	3	4	Great Effect 5
6. [illegible]					
8. [illegible]					
9. [illegible]					
10. [illegible]					
12. [illegible]					
13. [illegible]					
16. [illegible]					
17. [illegible]					
23. [illegible]					
24. [illegible]					
25. [illegible]					
26. [illegible]					
27. [illegible]					
28. [illegible]					
29. [illegible]					
30. [illegible]					
31. [illegible]					
32. [illegible]					
33. [illegible]					
34. [illegible]					
35. [illegible]					
36. [illegible]					
37. [illegible]					
38. [illegible]					
39. [illegible]					
40. [illegible]					
41. [illegible]					
42. [illegible]					
43. [illegible]					

Statement	Desirability
	VU 1 2 3 4 VD 5
1. [illegible]	
2. [illegible]	
31. MLTS will no longer be in existence.	
32. The number of MTS entering the field will continue to decline.	
33. [illegible] will gain increased control over all lab [illegible]	
34. [illegible]	
35. Physicians' assistants will perform all basic lab tests.	
36. [illegible] will perform all basic lab tests at all physician c [illegible]	
36. Laboratory administrators will be non-med techs.	
3. [illegible] to the field of medical technology will be at the [illegible]	
10. All students in clinical laboratory sciences education [illegible] education & continuous train to become medical technologists.	
20. Re-certification will be by pencil and paper tests only.	
21. Re-certification will be by performance examinations only.	
28. [illegible] certification will give way to state licensure in [illegible]	
29. Medical technologists will be only supervisors & educators.	
30. MLTS will provide all minor test performance.	
33. [illegible] technologists will become recognized as part of an [illegible] union.	
39. [illegible]	
40. [illegible] are not measured-	
41. [illegible] will result in a need for	
47. [illegible]	
12. Blood collections & processing will be totally automated.	
1. The [illegible] program will consist of a minimum of three	
5. [illegible]	
7. [illegible]	
8. [illegible]	
13. [illegible]	
14. A [illegible]	
16. [illegible]	
17. [illegible]	

Statement	Desirability VU 1	2	3	4	VD 5
25. [illegible] TECHNOLOGY PROFESSIONAL ORGANIZATION WILL ASSUME A [illegible]					
26. [illegible] WILL SEE A SMALL EMPLOYMENT CONTINUE [illegible]					
31. PATHOLOGISTS WILL BE LOWER IN LABORATORY STRUCTURE.					
34. [illegible]					
6. [illegible]					
10. [illegible]					
11. [illegible]					
15. [illegible]					
9. [illegible]					
17. [illegible]					
19. [illegible]					
20. [illegible]					
21. [illegible]					
22. [illegible]					
23. RE-CERTIFICATION WILL BE LEGALLY MANDATED.					
24. [illegible] WILL BE A COMBINATION OF PAPER & PENCIL EXAMS [illegible]					
36. MEDICAL TECHNOLOGISTS WILL BE GIVEN INCREASED AUTHORITY.					
41. AUTOMATED PROCEDURE UTILIZATION WILL INCREASE.					
42. MEDICAL TECHNOLOGISTS WILL INTERPRET ALL TEST RESULTS.					
43. [illegible]					
44. [illegible] AN INCREASING AMOUNT OF EDUCATION					
53. [illegible]					
54. [illegible]					
5. [illegible] INCREASED VOLUNTARY PARTICIPATION IN CONTIN-					
35. [illegible]					
37. THE PUBLIC IMAGE OF THE MEDICAL TECHNOLOGIST WILL IMPROVE.					

Statement	Median Year Predicted to Occur
31. AUTOMATED PROCEDURE UTILIZATION WILL INCREASE.	
13. [illegible] WILL GRANT THE INITIAL ADVANCED PLACEMENT IN THE FIELDS ON THE BASIS OF CERTIFICATION.	
32. THE NUMBER OF MTS ENTERING THE FIELD WILL CONTINUE TO DECLINE.	
35. [illegible]	
19. [illegible]	
10. [illegible]	
12. [illegible] WILL GRANT THE INITIAL ADVANCED PLACEMENT IN THE FIELDS ON THE BASIS OF CERTIFICATION.	
38. [illegible]	
21. [illegible]	
3. [illegible]	
15. [illegible]	
16. [illegible]	
24. RE-CERTIFICATION WILL BE BY PENCIL AND PAPER TESTS ONLY.	
27. [illegible]	
40. [illegible]	
7. THE MLT EDUCATIONAL PROGRAM WILL CONSIST OF A MINIMUM OF THREE [illegible]	
9. [illegible]	
33. [illegible]	
9. [illegible]	
29. MEDICAL TECHNOLOGISTS WILL BE ONLY SUPERVISORS & EDUCATORS.	
30. HLTS WILL PROVIDE ALL BENCH TEST PERFORMANCE.	
34. [illegible]	
49. [illegible]	
5. [illegible]	
18. [illegible]	
41. MEDICAL TECHNOLOGISTS WILL INTERPRET ALL TEST RESULTS.	

Statement

Median Year Predicted to Occur